

PARASITOIDS ASSOCIATED WITH A TASMANIAN  
POPULATION OF *NYCTEMERA AMICA* (WHITE)  
(LEPIDOPTERA: ARCTIIDAE)

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**Abstract**

*Nyctemera amica* (White) (Lepidoptera: Arctiidae) larvae feeding on *Senecio quadridentatus* Labill. (Asteraceae) at Sandy Bay, Hobart, were collected and reared in the laboratory to observe parasitism. Two species of primary parasitoid were recovered: *Diolcogaster perniciosus* (Wilkinson) (Hymenoptera: Braconidae) and *Chaetophthalmus similis* (Walker) (Diptera: Tachinidae). Mean parasitism by the two species was 25% and 12% respectively. A hyperparasitoid, *Mesochorus* sp. (Hymenoptera: Ichneumonidae), was found in association with 27% of *D. perniciosus* broods. Life-history observations on *N. amica* are included.

**Introduction**

*Nyctemera amica* (White) (Lepidoptera: Arctiidae) is a common tiger moth which occurs from central Queensland to Tasmania. Adults fly during the day and large population flights have been reported (Smithers 1977). The larvae, like the adults, are distinctively marked in orange and black and feed openly on *Senecio* species (Asteraceae). Benn *et al.* (1979) have shown that pyrrolizidine alkaloids from the host-plant, which are ingested by the larva, persist through both the adult and egg stages of the life-cycle and are even transferred to larval parasitoids. Notes on the biology of *N. amica* were given by Singh and Mabbett (1976), Benn *et al.* (1979) (both as *N. annulata*; but see Dugdale 1971 and Kay 1980) and Common (1990).

While Valentine (1967) recorded four parasitoids of *N. amica* in New Zealand, namely *Ecthomorpha intricatoria* (F.) (Hymenoptera: Ichneumonidae), *Microplitis* sp. (Hymenoptera: Braconidae), *Pales casta* (Hutton) and *P. nyctemeriana* (Hudson) (Diptera: Tachinidae), there are no similar references to parasitoids of this species in Australia. When large numbers of *N. amica* larvae were observed feeding on *Senecio quadridentatus* Labill. growing on the Sandy Bay campus of the University of Tasmania, the opportunity was taken to collect larvae for parasitism studies. This note reports the findings.

**Materials and methods**

All larvae were collected from *S. quadridentatus* growing in the immediate vicinity of the CSIRO Forestry Building. Four collections were made, on 1, 8 and 22 December 1994 and 28 February 1995. During the first collection larval numbers were recorded per host plant, for the first 49 plants searched. An effort was made to collect only advanced (large) larvae and the mean time from collection to pupation was  $6.7 \pm 0.4$  days ( $n = 90$ , mean  $\pm$  SE).

Larvae were reared in communal containers, each holding approximately 15-20 individuals. Containers were replenished with fresh clippings of *S. quadridentatus* every 2-3 days and were kept under ambient conditions (approximately 17-26°C). Following pupation (or emergence of parasitoids), individuals were placed in separate labelled containers. The sexually

dimorphic antennal character, the male being more plumose, was used to sex the adults on emergence.

### *Nyctemera amica* natural history

*N. amica* larvae were first noticed in large numbers feeding on *S. quadridentatus* in late October 1994. As advanced larvae were already present it is likely that oviposition commenced as much as a month earlier. Based on ease of collecting, larvae were most common at the beginning of December ( $0.59 \pm 0.15$  larvae per plant searched,  $n=49$ ), becoming less common during the month. Young larvae (approximately L2) were again noticed on plants in mid January 1995 and at the time of the 4th collection (end of February 1995) a range of larvae from L2-L5 was still present. Larvae continued to be present on plants until late March by which time they were rare. Adults were most commonly observed flying during January and early February. Copulating pairs were seen several times during this period, with the last pair recorded on 15 February 1995.

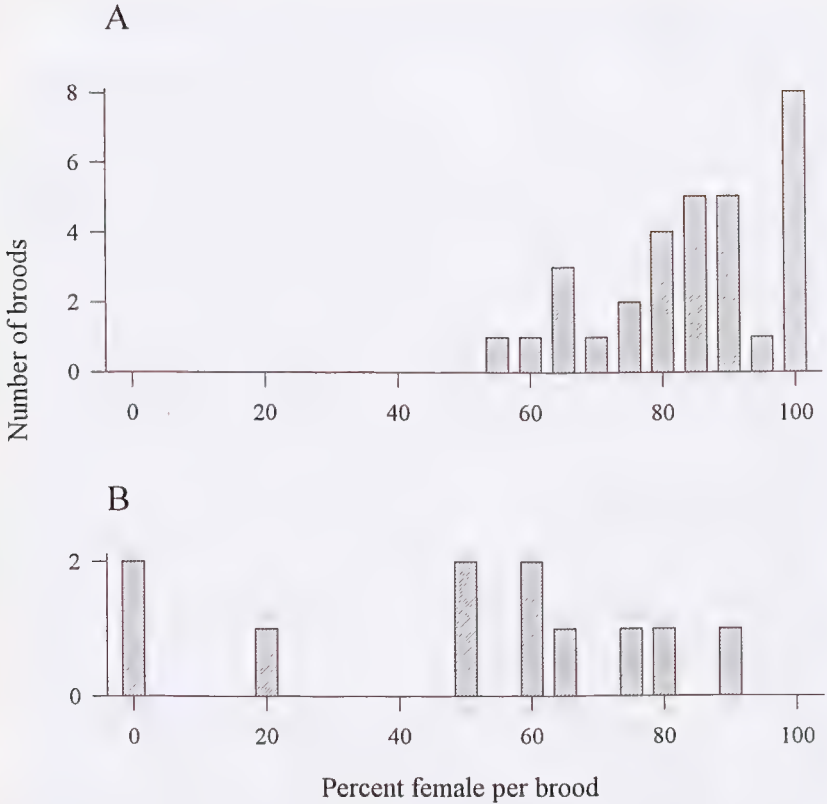
Mean pupal development time of *N. amica* in the laboratory was  $11.01 \pm 0.23$  days ( $n = 74$ ) and the sex ratio of reared adults did not differ significantly from unity ( $\chi^2$ ,  $df = 3$ ,  $p < 0.01$ ) (Table 1).

### Parasitism

Two species of primary parasitoid were recovered from larvae, these being *Diolcogaster perniciosus* (Wilkinson) (Hym.: Braconidae: Microgastrinae) and *Chaetophthalmus similis* (Walker) (Dipt.: Tachinidae: Tachininae) (Table 1). Mean percentage parasitism for the two species was  $0.25 \pm 0.03$  and  $0.13 \pm 0.03$  respectively. Both parasitoid species emerged from final stage larvae, rather than pupae. A hyperparasitoid, *Mesochorus* sp. (Hym.: Ichneumonidae: Mesochorinae), was found in association with 27% of *D. perniciosus* broods. Details for each species are given below.

**Table 1.** Fate of *Nyctemera amica* (White) larvae from 4 collections (1, 8 & 2.xii.1994 and 28.ii.1995) on *Senecio quadridentatus* growing in Sandy Bay, Hobart. Numbers in brackets, except for *Mesochorus* sp., are the proportions of each collection. For *Mesochorus* sp., numbers in brackets are the proportion of *D. perniciosus* broods parasitised. Bottom row represents totals.

Sample size	No. of male moths emerged	No. of female moths emerged	No. of larvae parasitised by <i>D. perniciosus</i>	No. of <i>D. perniciosus</i> broods parasitised by <i>Mesochorus</i> sp.	No. of larvae parasitised by <i>C. similis</i> .	Other mortality
53	18 (.34)	14 (.26)	15 (.28)	2 (.13)	3 (.06)	3 (.06)
44	13 (.30)	13 (.30)	9 (.20)	2 (.22)	6 (.13)	3 (.07)
33	8 (.24)	9 (.27)	7 (.21)	4 (.57)	5 (.15)	4 (.12)
31	4 (.13)	4 (.13)	10 (.32)	3 (.30)	6 (.19)	7 (.23)
161	43 (.27)	40 (.25)	41 (.25)	11 (.27)	20 (.12)	17 (.13)



**Figure 1.** Sex ratio of parasitoid broods reared from *Nyctemera amica* larvae collected from *Senecio quadridentatus* growing in Sandy Bay, Hobart: (A) *Diolcogaster perniciosus*; (B) *Mesochorus* sp.

*Diolcogaster perniciosus* was the most common parasitoid recovered and has been reared previously from *Spilosoma glatignyi* (Le Guillemot) (Lepidoptera: Arctiidae) (Austin & Dangerfield 1992). Its known geographic range previously extended from Queensland through N.S.W. and Victoria to South Australia (Austin & Dangerfield 1992); this is the first record of the genus from Tasmania. Non-parasitised *D. perniciosus* broods had a mean size of  $14.6 \pm 1.3$  individuals ( $n=31$ ) and were strongly female biased (Figure 1a), with a mean of  $86.1 \pm 2.3$  % females per brood.

*Mesochorus* sp. was found only in association with *D. perniciosus* broods. Since *Mesochorus* spp. are obligate hyperparasites (Naumann 1991, A. Austin pers comm.), it is most likely that this *Mesochorus* species is hyperparasitic on *D. perniciosus*. Mean brood size was  $6.45 \pm 1.15$  individuals ( $n=11$ ) and the mean brood sex ratio was near unity ( $50.6 \pm 9.3$  %

female), although some individual broods had highly male or female biased sex ratios (Figure 1b).

*Chaetophthalmus similis* was reared as a solitary parasitoid from final instar *N. amica* larvae. According to Cantrell (1985 and pers. comm.), *Chaetophthalmus* species have a wide host range which includes several noctuid species; they also have free living first instar larvae which actively seek a host. The related *C. dorsalis* (Macquart) has been reared previously from *N. amica* but this is the first known host record for *C. similis* (B. Cantrell pers. comm.).

### Other mortality

Thirteen percent of collected larvae failed to become adults due to causes which could not be directly attributed to parasitism (Table 1). These mortality factors were recorded as: pupal mortality (8 individuals); larval mortality due to fungal infection (4 individuals); other larval mortality (5 individuals).

### Acknowledgments

Dr Andy Austin (University of Adelaide) and Dr Bryan Cantrell (Queensland Department of Primary Industries) kindly identified the Hymenoptera and Tachinidae respectively and supplied additional biological information. Voucher specimens of parasitoid species have been deposited with the Tasmanian Museum.

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